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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/749,695	12/31/2003	Albert A. Vierheilig	113222.146 US1	2181
28089	7590	10/26/2007		
WILMERHALE/NEW YORK 399 PARK AVENUE NEW YORK, NY 10022			EXAMINER SINGH, PREM C	
			ART UNIT 1797	PAPER NUMBER
			NOTIFICATION DATE 10/26/2007	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/749,695	Applicant(s) VIERHEILIG ET AL.	
	Examiner Prem C. Singh	Art Unit 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 September 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 57-66, 77-92 and 100-120 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 57-66, 77-92 and 100-120 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>03/19/2007</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

Cancellation of claims 1-56 and 67-76 and withdrawal of claims 93-99 is noted.

IDS submitted on March 19, 2007 has been considered and signed by the examiner.

Terminal Disclaimer

The terminal disclaimer filed on 09/10/2007 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of copending Application 10/729,270 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Claim Rejections - 35 USC § 102 / § 103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

DETAILED ACTION

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Cancellation of claims 1-56 and 67-76 and withdrawal of claims 93-99 is noted.

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Claim Rejections - 35 USC § 102 / § 103

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 57-66, 77-92, and 100-120 are rejected under 35 U.S.C. 102(b) as anticipated by Vierheilg (US Patent 6,028,023) alone or as further evidenced by Stamires et al (US 2002/0110520 A1) and in the alternative, under 35 U.S.C. 103(a) as obvious over Vierheilg (US Patent 6,028,023) in view of Stamires et al (US 2002/0110520 A1).

Claim 57.

Vierheilig discloses a process for reducing sulfur in a FCC unit to refine petroleum (Column 15, lines 15-18). Vierheilig further discloses that hydrotalcite-like (HTL) compounds may be used as sorbents especially SO_x sorbent and hydrocarbon cracking catalyst for use in fluidized bed systems (See column 16, lines 10-16). Vierheilig also discloses that HTL compounds are also called "mixed metal hydroxides" and "anionic clays" (See column 1, lines 63-64; column 2, lines 8-17)

The process of making mixed metal hydroxide comprises:

- (a) "Preparing a reaction mixture comprising a divalent metal containing compound and a trivalent metal containing compound (Column 13, lines 16-18) forming an initial slurry or precipitation synthesis reaction" (Column 8, lines 12-14).
- (b) "The reaction product may be subjected to low temperature (i.e., less than 250°C) drying process before heat treatment" (Column 8, lines 35-39).
- (c) "Drying process may also include the physical formation of those powders, pellets, beads, extrudates, microspheroidal spheres or granule forms for use as catalysts, sorbents, etc." (Column 8, lines 40-45).
- (d) "The heat treatment step involves heating synthesis reaction products to a temperature in the range of about 300°C to about 850°C ." (Column 8, lines 49-52).

It is to be noted that Vierheilig invention uses the term "heat treatment" in step (d), the invention also uses the term "calcination" for heating beyond 300°C (Column 3, lines 13 and 43).

Although Vierheilig is silent as to the reduction of sulfur in gasoline produced in an FCC unit, the invention does disclose the use of HTL compound in an FCC unit as a catalyst per se (e.g., as hydrocarbon cracking catalyst for fluid bed systems), as SO_x binding agents, or as catalyst binder materials for other catalyst materials (See column 7, lines 39-42; column 16, lines 13-16). Thus, under 35 U.S.C. 102 (b), the presence of HTL compound in the FCC unit would appear to inherently produce gasoline with reduced sulfur.

Stamires discloses a similar shaped anionic clay/HTL composition (See page 2, paragraph 0041) produced by similar steps (See page 2, paragraphs 0034-0042; page 3, paragraphs 0042-0057; page 4, paragraphs 0059-0067) as Vierheilig and further discloses, "These compositions appear to be highly suitable for use as an additive or as a matrix for catalysts for hydrocarbon conversion, e.g., FCC and HPC. They are especially suitable for sulfur removal from the gasoline and diesel fraction in FCC, SO_x and NO_x removal in FCC, and as a metal trap." (Page 4, paragraph 0068).

Thus, it is clear that in Vierheilig process also the gasoline produced by FCC will have reduced sulfur as evidenced by Stamires.

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Claims 58-61.

Vierheilg's discloses that the divalent metal cation in step (a) is selected from Mg, Ca, Zn, Mn, Co, Ni, Sr, Ba, Fe and Cu and the trivalent metal cation in step (a) is selected from Al, Mn, Fe, Co, Ni, Cr, Ga, B, La and Ce. Vierheilg also discloses that the most preferred compounds in step (a) are CO_3^{2-} , NO_3^- , SO_4^{2-} , Cl^- and OH^- , Cr^- , I^- , SO_4^{2-} , SiO_3^{2-} , HPO_3^{2-} , MnO_4^{2-} , HGao_3^{2-} , HVO_4^{2-} , ClO_4^- and BO_3^{2-} and mixtures thereof". (See column 12, lines 16-27).

Claims 62, 78-80, and 106-108.

Vierheilg discloses in Table I the molar ratio of Mg:Al of 2/1, 3/1, and 5/1 (Column 18, lines 6-8). Vierheilg discloses, "This is evidenced by the presence of all major peaks of an HTL compound, including peaks at about 11.271 degrees.

Claims 63, 87-89, and 118-120.

Vierheilg discloses, "HTL compounds may comprise at least one HTL compound made by the process of this invention and at least one, chemically different, binder, matrix, or support, say calcium aluminate." (Column 18, lines 36-42).

Claims 64-66, and 90-92.

Vierheilg discloses, "Any of the HTL compounds may be used in FCC systems wherein the SO_x sorbent particle species comprises from about 10 to about 90 wt% of the overall SO_x additive system. Such an overall, SO_x additive system will, in turn,

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normally comprise from about 0.5 to about 10.0 wt % of a bulk hydrocarbon cracking catalyst (e.g. zeolite) SO_x additive system.” (Column 16, lines 1-9).

It is to be noted that bulk hydrocarbon cracking catalyst is the inventory of the regenerator.

Claims 77-80.

Claim 77 has all limitations of claim 57 and, in addition, requires magnesium/aluminum ratio and having a particular X-ray diffraction pattern.

With respect to claims 77-80, Vierheilig discloses in Table I the molar ratio of Mg:Al of 2/1, 3/1, and 5/1 (Column 18, lines 6-8). Vierheilig also discloses reflection at a two-theta position at about 43 degrees and 62 degrees (See column 21, lines 1-3).

Claims 81-83.

Vierheilig discloses, “Drying process may also include the physical formation of those powders, pellets, beads, extrudates, microspheroidal spheres or granule forms for use as catalysts, sorbents, etc.” (Column 8, lines 40-45).

Claims 84 and 112.

Vierheilig discloses in Table I that the HTL compound has MgO 52.1 wt% or more (Column 18, lines 9-11).

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Claims 85, 86, 116, and 117.

Vierheilig discloses, "Any number of well known oxidants may be employed in conjunction with applicant's HTL compounds. Such oxidants would include, for example, platinum, those compounds which form oxides of the rare earth metals, oxides of transition metals etc." (Column 17, lines 56-60).

Claims 100-104.

Claims 100-104 have all the limitations of claims 57 and 77 and have been discussed before.

Claim 105.

Vierheilig does not specifically mention about heating the compound prior to contacting with the feedstock.

Vierheilig does mention the use of HTL compound as hydrocarbon cracking catalyst in the FCC process. Since FCC process is carried out at elevated temperatures, it would have been obvious to one skilled in the art at the time the invention was made to heat the HTL compound prior to contacting with the feedstock for effective sulfur removal in the process.

Claims 109-111.

Claims 109-111 have all the limitations of claim 57 and discussed before.

Claim 113-115.

Claims 113-115 have all the limitations of claims 57 and 77 and discussed before.

Response to Arguments

Applicant's arguments filed 09/10/2007 have been fully considered but they are not persuasive.

The Applicant argues that Independent claims 57, 77, 100, and 104 are novel and non-obviousness because the reference, individually or combined, do not disclose methods of *using a precursor* (also referred as mixed metal oxide in the claims) in general and not in *an FCC unit*.

The Applicant's argument is not persuasive because Vierheilig discloses, "Above 600°C, the resulting metal oxide mixture begins to sinter...." (Column 4, lines 54-55). "Whatever their physical form (crystalline or amorphous), these precursor, synthesis reaction products may be subjected to some form of low temperature....." (Column 8, lines 34-36). "Temperatures such as 700-850oC are less preferred since various less desirable phases may result from heating Applicant's precursor, synthesis reaction products to such levels." (Column 8, lines 64-67). "The formation of these les desirable phases may diminish the precursor material's potential to form maximum amount of

HTL containing phases." (Column 9, lines 1-4). Similarly, Stamires discloses "aqueous precursor mixture" or "precursor mixture" at several places (See for example, page 2, paragraph 0027, 0028, 0034; page 3, paragraph 0052; page 5, paragraph 0071, 0072; page 6, claims 1(a), 1(b), 3, 6, and 7). Stamires also discloses, "These compositions appear to be highly suitable for use in FCC and HPC. They are especially suitable for sulfur removal from gasoline and diesel fraction in FCC, SO_x, and NO_x removal in FCC and as a metal trap." (Page 4, paragraph 0068).

The Applicant argues that precursor has multiple unexpected benefits and characteristics which differ from an HTL or calcined HTL, thereby showing that the precursor is not the same composition as HTL or calcined HTL. The Applicant further argues about attrition index and apparent bulk density with reference to Table IV, and figure 5 of Vierheilig (US Patent 6,028,023). The Applicant also argues that in Table IV, step 1 activation is an embodiment of the precursor, also referred to as mixed metal oxide, in pending claims and the step 2 activation is an embodiment of HTL.

The Applicant's argument is not persuasive because Vierheilig and Stamires, both references use precursor mixtures to produce the mixed metal oxide as claimed in claim 57. The Office action above clearly shows that Vierheilig follows exactly the same steps (a) through (d) to produce the mixed metal oxide as claimed by the Applicant. It is to be noted that step 2 activation has been given by Vierheilig to resistance to mechanical stress and improve attrition properties (See column 22, lines 21-37).

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Vierheilg clearly shows in Figure 5 that the composition still remains a "precursor" even after heat aging.

The Applicant argues about X-ray diffraction pattern and states that '023 reference Fig. 5 shows that the precursor has a different x-ray diffraction (XRD) pattern than HTL, and hence HTL and precursor are not the same compositions. Fig. 5 of '023 reference shows that the 3rd graph from top labeled 'heat treated' is the x-ray diffraction pattern of the precursor while the 4th graph labeled "heat treat + hydrate (activated HTL)" is the resulting HTL structure, wherein the 3rd and 4th graphs are not the same.

The Applicant's argument is not persuasive because with reference to graphs 1st and 2nd, Vierheilg has clearly mentioned that both are HTL precursor before and after heat aging. This clearly shows that whether heat treated or non-treated, both are precursors.

The Applicant argues about several advantages and multiple different structural differences of precursor from an HTL as discussed in specifications of the present Application.

The Applicant's argument is not persuasive because HTL is also a precursor as discussed before.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Prem C. Singh whose telephone number is 571-272-6381. The examiner can normally be reached on MF 8:00 AM- 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PS/092607



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